# Water Quality Assessment
# An unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek
# Scarp Ridge LLC., Irwin Mountain LodgeWWTF

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## I. Water Quality Assessment Summary

Table A-1 includes summary information related to this WQA. This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and Monitoring and Evaluation listings; low flow and facility flow summaries; and a list of parameters evaluated.

**Table A-1**
**WQA Summary**

| Facility Information | | | |
|---|---|---|---|
| **Facility Name** | **Permit Number** | **Design Flow (max 30-day ave, MGD)** | **Design Flow (max 30-day ave, CFS)** |
| F1. Irwin Mountain Lodge | CO0045217 | 0.01375 | 0.02 |

| Receiving Stream Information | | | |
|---|---|---|---|
| **Receiving Stream Name** | **Segment ID** | **Designation** | **Classification(s)** |
| S1. An unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Ck. | COGUNF04 | Undesignated | Cold Water Aquatic Life<br>Class 1 Class E Exisiting<br>Primary Contact Use<br>Agriculture<br>Water Supply |
| S2. Lakes and reservoirs tributary to Muddy Creek, Paonia Reservoir or Coal Creek. | COGUNF09 | Undesignated | Cold Water Aquatic Life<br>Class 1 Class E Exisiting<br>Primary Contact Use<br>Agriculture<br>Water Supply |

| Low Flows (cfs) | | | | |
|---|---|---|---|---|
| **Receiving Stream Name** | **1E3 (1-day)** | **7E3 (7-day)** | **30E3 (30-day)** | **Ratio of 30E3 to the Design Flow (cfs)** |
| S1. An unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Ck. | 0 | 0 | 0 | 0:1 |
| S2. Lakes and reservoirs tributary to Muddy Creek, Paonia Reservoir or Coal Creek | 0 | 0 | 0 | 0:1 |

| Regulatory Information | | | | | |
|---|---|---|---|---|---|
| **T&E Species** | **303(d) (Reg 93)** | **Monitor & Eval (Reg93)** | **Existing TMDL** | **Temporary Modification(s)** | **Control Regulation** |
| No | COGUNF04-Muddy Ck, East Muddy Ck, Island Res | None | No | None | 93 |

| Pollutants Evaluated |
|---|
| Ammonia, E. Coli, TRC, Temp |

# II. Introduction

The water quality assessment (WQA) of an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek and the Gunnison River near the Irwin Mountain Lodge (WWTF), located in Gunnison County, is intended to determine the assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other requirements as discussed in the permit rationale. Figure A-1 contains a map of the study area evaluated as part of this WQA.

**FIGURE A-1**


The Irwin Mountain Lodge WWTF discharges to an unnamed tributary to Lake Irwin, which drains into Anthracite Creek, and subsequently to Coal Creek, which is stream segment COGUNF04. This means the Gunnison River Basin, North Fork Sub-basin, Stream Segment 04. This segment is composed of the "Muddy Creek, including all tributaries and wetlands, from the sourceto the confluence with Coal Creek. Coal Creek, including all tributaries and wetlands, from the source to

the confluence with Muddy Creek. All tributaries to the North Fork of the Gunnison from its inception at the confluence of Muddy Creek and Coal Creek to the confluence with the Gunnison River within national forest boundaries, except for the specific listing in Segment 1.". Lake Irwin is in Stream segment COGUNF09 is classified for Cold Water Aquatic Life Class 1, Class E Exisiting Primary Contact Use, Water Supply and Agriculture. Since the both segments have the same classifications, this analysis is limited to segment 04 considerations as these will be protective of segment 09.

The data used in the assessment consist of the best information available at the time of preparation of this WQA analysis.

## III. Water Quality Standards

**Narrative Standards**

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

(i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or (v) produce a predominance of undesirable aquatic life; or (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

(i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in CDPS discharge permits.

**Standards for Organic Parameters and Radionuclides**

**Radionuclides:** Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.

In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

**Table A-2**
**Radionuclide Standards**

| Parameter | Picocuries per Liter |
|---|---|
| Americium 241* | 0.15 |
| Cesium 134 | 80 |
| Plutonium 239, and 240* | 0.15 |
| Radium 226 and 228* | 5 |
| Strontium 90* | 8 |
| Thorium 230 and 232* | 60 |
| Tritium | 20,000 |

*Radionuclide samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values for both plutonium and americium.

**Organics:** The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as "interim standards" and will remain in effect until alternative permanent standards are adopted by the Commission. These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards for organics apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where the Water Quality Control Commission has made such determination.

Because an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek is classified for Cold Water Aquatic Life Class 1, with a water supply designation, the water + fish, fish ingestion, and aquatic life standards apply to this discharge.

## Salinity

**Salinity:** Regulation 61.8(2)(l) contains requirements regarding salinity for any discharges to the Colorado River Watershed. For industrial dischargers and for the discharge of intercepted groundwater, this is a no-salt discharge requirement. However, the regulation states that this requirement may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 350 tons per year. The Division may permit the discharge of salt upon a satisfactory demonstration that it is not practicable to prevent the discharge of all salt. See Regulation 61.8(2)(l)(i)(A)(1) for industrial discharges and 61.8(2)(l)(iii) for discharges of intercepted groundwater for more information regarding this demonstration.

For municipal dischargers, an incremental increase of 400 mg/l above the flow weighted averaged salinity of the intake water supply is allowed. This may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 366 tons per year. The Division may permit the discharge of salt in excess of the 400 mg/l incremental increase, upon a satisfactory demonstration that it is not practicable to attain this limit. See Regulation 61.8(2)(l)(vi)(A)(1) for more information regarding this demonstration.

Regulation 75 contains requirements for the release of water from Cheraw Lake. Any entity releasing water from Cheraw Lake must ensure that either: 1) the water has a TDS concentration less than or equal to 4300 mg/l, or 2) that an adequate quantity of water of less saline nature can be supplied for dilution purposes such that a salinity level of 4300 ppm, measured as TDS, can be maintained in Horse Creek immediately above the first diversion below the confluence with the Cheraw Lake outlet channel.

In addition, the Division's policy, Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, may be applied to discharges where an agricultural water intake exists downstream of a discharge point. Limitations for electrical conductivity and sodium absorption ratio may be applied in accordance with this policy.

## Temperature

Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

## Segment Specific Numeric Standards

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Water Quality Control Commission. The standards in Table A-3 have been assigned to stream segment COGUNF04 in accordance with the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*.

| Table A-3<br>In-stream Standards for Stream Segment **COGUNF04** |
|---|
| Physical and Biological |
| Dissolved Oxygen (DO) = 6 mg/l, minimum (7 mg/l, minimum during spawning) |
| pH = 6.5 - 9 su |
| E. coli chronic = 126 colonies/100 ml |
| Temperature June-Sept = 17° C MWAT and 21.7° C DM |
| Temperature Oct-May = 9° C MWAT and 13° C DM |
| Inorganic |
| Total Ammonia acute and chronic = TVS |
| Chlorine acute = 0.019 mg/l |
| Chlorine chronic = 0.011 mg/l |
| Free Cyanide acute = 0.005 mg/l |
| Sulfide chronic = 0.002 mg/l |
| Boron chronic = 0.75 mg/l |
| Nitrite acute = 0.05 mg/l |
| Nitrate acute = 10 mg/l |
| Chloride chronic = 250 mg/l |
| Sulfate chronic = For WS, the greater of ambient water quality as of January 1, 2000 or 250 mg/l |
| Metals |
| Total Recoverable Aluminum acute and chronic = TVS |
| Dissolved Arsenic acute = 340 µg/l |
| Total Recoverable Arsenic chronic = 0.02 µg/l |
| Dissolved Cadmium acute and chronic = TVS |
| Total Recoverable Trivalent Chromium acute = 50 µg/l |
| Dissolved Trivalent Chromium Chronic = TVS |
| Dissolved Hexavalent Chromium acute and chronic = TVS |
| Dissolved Copper acute and chronic = TVS |
| Dissolved Iron chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 300 µg/l |
| Total Recoverable Iron chronic = 1000 µg/l |
| Dissolved Lead acute and chronic = TVS |
| Dissolved Manganese chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 50 µg/l |
| Dissolved Manganese acute and chronic = TVS |
| Total Recoverable Molybdenum chronic = 160 µg/l |
| Total Mercury chronic = 0.01 µg/l |
| Dissolved Nickel acute and chronic = TVS |
| Dissolved Selenium acute and chronic = TVS |
| Dissolved Silver acute and chronic = TVS |
| Dissolved Zinc acute and chronic = TVS |

## Table Value Standards and Hardness Calculations

As metals with standards specified as TVS are not included as parameters of concern for this facility, the hardness value of the receiving water and the subsequent calculation of the TVS equations is inconsequential and is therefore omitted from this WQA.

## Total Maximum Daily Loads and Regulation 93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List

This portion of stream segment is not listed on the Division's 303(d) list of water quality impacted streams and is not on the monitoring and evaluation list.

# IV. Receiving Stream Information

**Low Flow Analysis**

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

The discharge is to an unnamed tributary to Lake Irwin. Based on the previous WQA the 1E3 and 30E3 monthly low flows were set at zero, although there is periodic flow in the tributary as is typical for first order streams.

**Table A-4**

**Low Flows for An unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek for the Irwin Mountain Lodge**

| *Low Flow (cfs)* | *Annual* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1E3 Acute | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 7E3 Chronic | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 30E3 Chronic | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

The ratio of the low flow of an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek and the Gunnison River to the Irwin Mountain Lodge WWTF design flow is 0:1

Note that since the low flow has been determined to be zero, the ambient water quality discussion is unnecessary and has therefore been deleted in this WQA. This is explained in more detail under the Technical Information discussion in Section VI.

**Ambient Water Quality**

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and*

*Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19). The ambient water quality was not assessed for An unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek. because the background in-stream low flow condition is zero, and because no ambient water quality data are available for an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal upstream of the Scarp Ridge LLC. WWTF discharge.

## V. Facility Information and Pollutants Evaluated

**Facility Information**

The Irwin Mountain Lodge WWTF is located at T13S, R87W of the 6th PM, Clara Lode 2801 in Gunnison County. The current design capacity of the facility is 0.01375 MGD (0.02 cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process. It should be noted here that the facility has yet to be rebuilt but the permittee keeps the permit renewed. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity.

Due to the in-stream low flow of zero, the assimilative capacities during times of low flow are not affected by nearby contributions. Therefore, modeling nearby facilities in conjunction with this facility was not necessary.

**Pollutants of Concern**

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit rationale.

There are no site-specific in-stream water quality standards for $BOD_5$ or $CBOD_5$, TSS, percent removal, and oil and grease for this receiving stream. Thus, assimilative capacities were not determined for these parameters. The applicable limitations for these pollutants can be found in Regulation No. 62 and will be applied in the permit for the WWTF.

The following parameters were identified by the Division as pollutants to be evaluated for this facility:

- Total Residual Chlorine
- *E. coli*
- Ammonia
- Temperature

Based upon the size of the discharge, the lack of industrial contributors, dilution provided by the receiving stream and the fact that no unusually high metals concentrations are expected to be found in the wastewater effluent, metals are not evaluated further in this water quality assessment.

According to the *Rationale for Classifications, Standards and Designations of the Gunnison River*, stream segment COGUNF04 is designated a water supply because, the Town of Paonia (#115601) withdraws water from spring #34 (groundwater under the influence of surface water) for domestic water supply. The nearest drinking water intake, the town of Paonia, is approximately 32 miles downstream.

According to the *Rationale for Classifications, Standards and Designations of the Gunnison River*, stream segment COGUNF09 is designated a water supply, however "There are no currently identified community systems withdrawing surface water or groundwater under the influence of surface water from this segment."

For these reasons, the nitrate standard is not evaluated as part of this analysis.

During assessment of the facility, nearby facilities, and receiving stream water quality, no additional parameters were identified as pollutants of concern.

## VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

**Technical Information**

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (federal effluent limitations guidelines, state effluent limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections II and III are used to determine the assimilative capacity of an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek and the Gunnison River near the Irwin Mountain Lodge WWTF for pollutants of concern, and to calculate the WQBELs. For all parameters except ammonia, it is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis. For ammonia, it is the standard procedure of the Division to determine monthly WQBELs using the monthly low flows, as the regulations allow the use of seasonal flows.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants and modeling for pollutants such as ammonia. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard. The mass-balance equation is expressed as:

$$M_2 = \frac{M_3 Q_3 - M_1 Q_1}{Q_2}$$

Where,

$Q_1$ = Upstream low flow (1E3 or 30E3)
$Q_2$ = Average daily effluent flow (design capacity)
$Q_3$ = Downstream flow ($Q_1$ + $Q_2$)
$M_1$ = In-stream background pollutant concentrations at the existing quality
$M_2$ = Calculated WQBEL
$M_3$ = Water Quality Standard, or other maximum allowable pollutant concentration

When $Q_1$ equals zero, $Q_2$ equals $Q_3$, and the following results:

$$M_2 = M_3$$

Because the low flow ($Q_1$) for an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek and the Gunnison River is zero, the WQBELs for An unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek and the Gunnison River for the pollutants of concern are equal to the in-stream water quality standards.

A more detailed discussion of the technical analysis is provided in the pages that follow.

**Calculation of WQBELs**

Using the mass-balance equation provided in the beginning of Section VI, the acute and chronic low flows set out in Section IV, ambient water quality as discussed in Section IV, and the in-stream standards shown in Section III, the WQBELs for were calculated. The data used and the resulting WQBELs, $M_2$, are set forth in Table A-5a for the chronic WQBELs and A-5b for the acute WQBELs.

Where a WQBEL is calculated to be a negative number and interpreted to be zero and/or when the ambient water quality exceeds the in-stream standard, the Division standard procedure is to allocate the water quality standard to prevent further degradation of the receiving waters.

**Chlorine:** There are no point sources discharging total residual chlorine within one mile of the Irwin Mountain Lodge WWTF. Because chlorine is rapidly oxidized, in-stream levels of residual chlorine are detected only for a short distance below a source. Ambient chlorine was therefore assumed to be zero.

***E. coli*:** There are no point sources discharging E. coli within one mile of the Irwin Mountain Lodge WWTF. Thus, WQBELs were evaluated separately. In the absence of *E. coli* ambient water quality data, fecal coliform ambient data are used as a conservative estimate of *E. coli* existing quality. For *E. coli*, the Division establishes the 7-day geometric mean limit as two times the 30-day geometric mean limit and also includes maximum limits of 2,000 colonies per 100 ml (30-day geometric mean) and 4,000 colonies per 100 ml (7-day geometric mean). This 2000 colony limitation also applies to

discharges to ditches.

**Temperature:**

The 7E3 low flow is 0, so the discharge is to an effluent dependent (ephemeral stream without the presence of wastewater) water therefore in accordance with Regulation 31.14(14), no temperature limitations are required.

**Table A-5a**

**Chronic WQBELs**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ |
|---|---|---|---|---|---|---|
| E. coli (#/100 ml) | 0 | 0.021 | 0.021 | 1 | 126 | ***126*** |
| TRC (mg/l) | 0 | 0.021 | 0.021 | 0 | 0.011 | ***0.011*** |

**Table A-5b**

**Acute WQBELs**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ |
|---|---|---|---|---|---|---|
| E. coli (#/100 ml) | chronic X 2 = acute | | | | | ***252*** |
| TRC (mg/l) | 0 | 0.021 | 0.021 | 0 | 0.019 | ***0.019*** |

**Ammonia:** The Ammonia Toxicity Model (AMMTOX) is a software program designed to project the downstream effects of ammonia and the ammonia assimilative capacities available to each discharger based on upstream water quality and effluent discharges. To develop data for the AMMTOX model, an in-stream water quality study should be conducted of the upstream receiving water conditions, particularly the pH and corresponding temperature, over a period of at least one year.

Temperature and corresponding pH data sets reflecting upstream ambient receiving water conditions were available for an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek and the Gunnison River based on Riverwatch Station 645 (AN-1). The data, reflecting a period of record from May 2001 through April 2002, were used to establish the setpoint and average headwater conditions in the AMMTOX model.

There were no pH or temperature data available for the Irwin Mountain Lodge WWTF that could be used as adequate input data for the AMMTOX model. Therefore, the Division standard procedure is to rely on statistically-based, regionalized data for pH and temperature compiled from similar facilities and receiving waters.

The AMMTOX may be calibrated for a number of variables in addition to the data discussed above. The values used for the other variables in the model are listed below:

- Stream velocity = $0.3Q^{0.4d}$
- Default ammonia loss rate = 6/day
- pH amplitude was assumed to be medium

- Default times for pH maximum, temperature maximum, and time of day of occurrence
- pH rebound was set at the default value of 0.2 su per mile
- Temperature rebound was set at the default value of 0.7 degrees C per mile.

The results of the ammonia analyses for the Irwin Mountain Lodge WWTF are presented in Table A-6.

**Table A-6**

**AMMTOX Results for an unnamed tributary to Lake Irwin, which is a tributary to the Anthracite Creek, and subsequently to Coal Creek and the Gunnison River at the Irwin Mountain Lodge WWTF**

***Design of 0.01375 MGD (0.02 cfs)***

| *Month* | *Total Ammonia Chronic (mg/l)* | *Total Ammonia Acute (mg/l)* |
|---|---|---|
| **January** | 5.2 | 19 |
| **February** | 5.3 | 19 |
| **March** | 5.1 | 18 |
| **April** | 5.1 | 18 |
| **May** | 5.1 | 18 |
| **June** | 4.6 | 18 |
| **July** | 4.0 | 17 |
| **August** | 4.1 | 20 |
| **September** | 4.1 | 18 |
| **October** | 4.6 | 18 |
| **November** | 5.1 | 18 |
| **December** | 5.1 | 18 |

## Whole Effluent Toxicity (WET) Testing:

The Water Quality Control Division has established the use of WET testing as a method for identifying and controlling toxic discharges from wastewater treatment facilities. WET testing is being utilized as a means to ensure that there are no discharges of pollutants "in amounts, concentrations or combinations which are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life" as required by Section 31.11 (1) of the Basic Standards and Methodologies for Surface Waters. The requirements for WET testing are being implemented in accordance with Division policy, Implementation of the Narrative Standard for Toxicity in Discharge Permits Using Whole Effluent Toxicity (Sept 30, 2010). Note that this policy has recently been updated and the permittee should refer to this document for additional information regarding WET.

In-Stream Waste Concentration (IWC) – Where monitoring or limitations for WET are deemed appropriate by the Division, the chronic in-stream dilution is critical in determining whether acute or chronic conditions shall apply. In accordance with Division policy, for those discharges where the chronic IWC is greater than 9.1% and the receiving stream has a Class 1 Aquatic Life use or Class 2 Aquatic Life use with all of the appropriate aquatic life numeric standards, chronic conditions will

normally apply. Where the chronic IWC is less than or equal to 9.1, or the stream is not classified as described above, acute conditions will normally apply. The chronic IWC is determined using the following equation:

IWC = [Facility Flow (FF)/(Stream Chronic Low Flow (annual) + FF)] X 100%

The flows and corresponding IWC for the appropriate discharge point are:

| Permitted Feature | Chronic Low Flow, 30E3 (cfs) | Facility Design Flow (cfs) | IWC, (%) |
|---|---|---|---|
| 001 | 0 | 0.02 | 100 |

The IWC for this permit is 100 %, which represents a wastewater concentration of 100 % effluent to 0 % receiving stream. This IWC correlates to chronic WET testing. The fact sheet and the permit will contain additional information regarding the type of WET testing applicable to this facility.

## VII. Antidegradation Evaluation

As set out in *The Basic Standards and Methodologies for Surface Water*, Section 31.8(2)(b), an antidegradation analysis is required except in cases where the receiving water is designated as "Use Protected." Note that "Use Protected" waters are waters "that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process" as set out in Section 31.8(2)(b). The antidegradation section of the regulation became effective in December 2000, and therefore antidegradation considerations are applicable to this WQA analysis.

According to the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*, stream segment COGUNF04 is Undesignated. Thus, an antidegradation review is required for this segment if new or increased impacts are found to occur.

**Introduction to the Antidegradation Process**

The antidegradation process conducted as part of this water quality assessment is designed to determine if an antidegradation review is necessary and if necessary, to complete the required calculations to determine the limits that can be selected as the antidegradation-based effluent limit (ADBEL), absent further analyses that must be conducted by the facility.

As outlined in the *Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance* (AD Guidance), the first consideration of anantidegradation evaluation is to determine if new or increased impacts are expected to occur. This is determined by a comparison of the newly calculated WQBELs verses the existing permit limitations in place as of September 30, 2000, and is described in more detail in the analysis. Note that the AD Guidance refers to the permit limitations as of September 30, 2000 as the existing limits.

If a new or increased impact is found to occur, then the next step of the antidegradation process is to go through the significance determination tests. These tests include: 1) bioaccumulative toxic pollutant test; 2) temporary impacts test; 3) dilution test (100:1 dilution at low flow) and; 4) a concentration test.

As the determination of new or increased impacts, and the bioaccumulative and concentration significance determination tests require more extensive calculations, the Division will begin the antidegradation evaluation with the dilution and temporary impact significance determination tests. These two significance tests may exempt a facility from further AD review without the additional calculations.

Note that the antidegradation requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard should be used. The appropriate standards are used in the following antidegradation analysis.

**Significance Tests for Temporary Impacts and Dilution**

The ratio of the chronic (30E3) low flow to the design flow is 0:1, and is less than the 100:1 significance criteria. Therefore this facility is not exempt from an AD evaluation based on the dilution significance determination test, and the AD evaluation must continue.

For the determination of a new or increased impact and for the remaining significance determination tests, additional calculations are necessary. Therefore, at this point in the antidegradation evaluation, the Division will go back to the new or increased impacts test. If there is a new or increased impact, the last two significance tests will be evaluated.

**New or Increased Impact and Non Impact Limitations (NILs)**

To determine if there is a new or increased impact to the receiving water, a comparison of the new WQBEL concentrations and loadings verses the concentrations and loadings as of September 30, 2000, needs to occur. If either the new concentration or loading is greater than the September 2000 concentration or loading, then a new or increased impact is determined. If this is a new facility (commencement of discharge after September 30, 2000) it is automatically considered a new or increased impact.

Note that the AD Guidance document includes a step in the New or Increased Impact Test that calculates the Non-Impact Limit (NIL). The permittee may choose to retain a NIL if certain conditions are met, and therefore the AD evaluation for that parameter would be complete. As the NIL is typically greater than the ADBAC, and is therefore the chosen limit, the Division will typically conclude the AD evaluation after determining the NIL. Where the NILs are very stringent, or upon request of a permittee, the Division will calculate both the NIL and the AD limitation so that the limitations can be compared and the permittee can determine which of the two limits they would prefer, one which does not allow any increased impact (NIL), or the other which allows an insignificant impact (AD limit).

The non impact limit (NIL) is defined as the limit which results in no increased water quality impact (no increase in load or limit over the September 2000 load or limit). The NIL is calculated as the September 2000 loading, divided by the new design flow, and divided by a conversion factor of 8.34. If there is no change in design flow, then the NIL is equal to the September 2000 permit limitation.

If the facility was in place, but did not have a limitation for a particular parameter in the September 2000 permit, the Division may substitute an implicit limitation. Consistent with the First Update to the AD Guidance of April 2002, an implicit limit is determined based on the approach that specifies that the implicit limit is the maximum concentration of the effluent from October 1998 to September 2000, if such data is available. If this data is unavailable, the Division may substitute more recent representative data, if appropriate, on a case by case basis. Note that if there is a change in design flow, the implicit limit/loading is subject to recalculation based on the new design flow. For parameters that are undisclosed by the permittee, and unknown to the Division to be present, an implicit limitation may not be recognized.

This facility was in place as a discharger prior to September 30, 2000, and therefore the new or increased impacts test must be conducted. As the design flow for this facility is the same as it was in September 2000, the NILs are equal to the permit limitations as of September 2000. It should be noted that even though a permit was issued for the facility on 11/20/1997, and was renewed and reissued on 4/26/2005. For this renewal action the Division will consider this facility as an existing permittee even though there was no discharge to date.

For total residual chlorine, total ammonia, and fecal coliform, the limitations as of September 2000 were used in the evaluation of new or increased impacts. However the permit limits for fecal coliform was for 30 day average, and 60 for 7 day average which the Division believes was in error. Based on the fact sheet for this permit (1997) the fecal coliform should have been 200/100ml as reflected in the current permit. Therefore the Division will assign a fecal coliform limit of 200/400 instead of the 30/60 for Sept. of 2000. The stream standard f

or bacteria is now E. coli. Therefore the Division will implement E. coli limitation in the permit. In accordance with the Division's practice regarding *E. coli*, an implicit limit for *E. coli* is determined as 0.32 times the permit limit for fecal coliform.

**Calculation of Loadings for New or Increased Impact Test**

The equations for the loading calculations are given below. Note that the AD requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the AD review; however, where there is only an acute standard, the acute standard should be used. Thus, the chronic low flows will be used later in this AD evaluation for all parameters with a chronic standard, and the acute low flows will be used for those parameters with only an acute standard.

$$\textit{Previous permit load} = M_{permitted}\,(mg/l) \times Q_{permitted}\,(mgd) \times 8.34$$
$$\textit{New WQBELs load} = M_2\,(mg/l) \times Q_2\,(mgd) \times 8.34$$

Where,

$M_{permitted}$ = September 2000 permit limit (or implicit limit) **(mg/l)**

$Q_{permitted}$ = design flow as of September 2000 **(mgd)**
$Q_2$ = current design flow (same as used in the WQBEL calculations)
$M_2$ = new WQBEL concentration **(mg/l)**
*8.34* = unit conversion factor

Table A-7 shows the results of these calculations and the determination of a new or increased impact.

**Calculation of Non-Impact Limitations**

The design flow of this facility as of September 30, 2000 was 0.01375 MGD. The new design flow of this facility is 0.01375 MGD. To determine if new or increased impacts are to occur, the September 2000 permit concentrations need to be adjusted for this new design flow. The equations are shown below.

$$\textit{September 2000 permit load} = M_{permitted} \times Q_{permitted} \times 8.34$$
$$\textit{Non Impact Limit (NIL)} = \textit{September 2000 permitted load} \div \textit{New Design Flow} \div 8.34$$

Where,

$M_{permitted}$ = September 2000 permit limit or implicit limit **(mg/l)**
$Q_{permitted}$ = September 2000 design flow **(mgd)**
$Q_2$ = new or current design flow **(mgd)**
*8.34* = Unit conversion factor

Table A-7 shows the results of these calculations and the determination of a new or increased impact.

**Table A-7**
**Determination of New or Increased Impacts**

| ***Pollutant*** | ***Sept 2000 Permit Limit*** | ***Sept 2000 Permit Load (lbs/day)*** | ***NIL*** | ***New WQBEL*** | ***New WQBEL Load (lbs/day)*** | ***New or Increased Impact*** |
|---|---|---|---|---|---|---|
| E. coli (#/100 ml) | 64 | 7.3 | 64 | 126 | 14 | Yes |
| TRC (mg/l) | 0.0017 | 0.00019 | 0.0017 | 0.011 | 0.0013 | Yes |
| $NH_3$, Tot (mg/l) Jan | 8.4 | 0.96 | 8.4 | 5.2 | 0.6 | No |
| $NH_3$, Tot (mg/l) Feb | 8.4 | 0.96 | 8.4 | 5.3 | 0.6 | No |
| $NH_3$, Tot (mg/l) Mar | 7.7 | 0.88 | 7.7 | 5.1 | 0.58 | No |
| $NH_3$, Tot (mg/l) Apr | 7.1 | 0.81 | 7.1 | 5.1 | 0.58 | No |
| $NH_3$, Tot (mg/l) May | 6.6 | 0.76 | 6.6 | 5.1 | 0.58 | No |
| $NH_3$, Tot (mg/l) Jun | 4.8 | 0.55 | 4.8 | 4.6 | 0.53 | No |
| $NH_3$, Tot (mg/l) Jul | 4.4 | 0.5 | 4.4 | 4.0 | 0.46 | No |
| $NH_3$, Tot (mg/l) Aug | 3.8 | 0.44 | 3.8 | 4.1 | 0.47 | Yes |
| $NH_3$, Tot (mg/l) Sep | 4.8 | 0.55 | 4.8 | 4.1 | 0.47 | No |
| $NH_3$, Tot (mg/l) Oct | 5.6 | 0.64 | 5.6 | 4.6 | 0.53 | No |
| $NH_3$, Tot (mg/l) Nov | 6.6 | 0.76 | 6.6 | 5.1 | 0.58 | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| $NH_3$, Tot (mg/l) Dec | 8.4 | 0.96 | 8.4 | 5.1 | 0.59 | No |

As shown in Table A-7, there are no new or increased impacts to the receiving stream based on the new WQBELS for monthly ammonia except for August and for these parameters the AD evaluation is complete and the WQBELs are the final result of this WQA.

For monthly ammonia (August) there is new or increased impacts and in accordance with regulation, the permittee has the option of choosing either the NIL's or ADBAC's. Because the ADBAC's are generally more stringent than NIL's, the Division assumes that the permittee will choose NIL's rather than ADBAC's, and therefore the Division will stop the AD evaluation at this point and assign the NILs to the permit.

For E. coli and TRC there are new or increased impacts and in accordance with regulation, the permittee has the option of choosing either the NIL's or ADBAC's. Normally, the Division would assign the NILs as permit limitations, or prescribe monitoring to determine the appropriate implicit limitations as necessary, however, in this case, the NILs are very stringent and therefore the Division will automatically calculate the ADBACs for comparison.

The final significance determination test for this facility needs to be applied, to determine if AD limits are applicable. . For the concentration test, the BWQ, significant concentration thresholds (SCT) and antidegradation based average concentrations (ADBACs) need to be calculated. These calculations are explained in the following sections, and each significance determination test will be performed as the necessary calculations are complete. The AD low flow may also need to be calculated when determining the BWQ for an existing discharger (as of Sept 2000) when upstream water quality data are used.

**Determination of Baseline Water Quality (BWQ)**

The BWQ is the ambient condition of the water quality as of September 30, 2000. The BWQ defines the baseline low flow pollutant concentration, and for bioaccumulative toxic pollutants, the baseline load. The BWQ is to take into account the influence of the discharger if the discharge was in place prior to September 30, 2000. In such a case, data from a downstream location should be used to determine the BWQ. If only upstream data is available, then a mass balance equation may be applied, using the facilities effluent data to determine the BWQ. If the discharge was not present prior to September 30, 2000, then the influence of that discharge would not be taken into account in determining the BWQ. If the BWQ has already been determined in a previous WQA AD evaluation, it may not need to be recalculated as the BWQ is the water quality as of September 30, 2000, and therefore should not change unless additional data is obtained or the calculations were in error.

The BWQ concentrations were correctly determined for E. Coli and TRC potential pollutants of concern as part of a previous WQA (3/1/2005). These are summarized in Table A-8.

**Table A-8**

**BWQ Concentrations Based on Previous Determinations**

| *Pollutant* | $M_{eff}$ | $Q_{eff}$ *(cfs)* | $M_{u/s}$ | $Q_{u/s}$ *(cfs)* | *BWQ* | *WQS* |
|---|---|---|---|---|---|---|
| E. coli (#/100 ml) | | | | | 8 | 126 |
| TRC (mg/l) | | | | | 0.0044 | 0.011 |

**Bioaccumulative Significance Test**

Parameters associated with the bioaccumulative significance test are not parameters of concern for this facility. This section is therefore omitted.

**Significant Concentration Threshold**

The SCT is defined as the BWQ plus 15% of the baseline available increment (BAI), and is calculated by the following equation:

$$SCT = (0.15 \times BAI) + BWQ$$

The BAI is the concentration increment between the baseline water quality and the water quality standard, expressed by the term (WQS – BWQ). Substituting this into the SCT equation results in:

$$SCT = 0.15 \times (WQS\text{-}BWQ) + BWQ$$

Where,

*WQS* = Chronic standard or, in the absence of a chronic standard, the acute standard
BWQ = Value from Table A-8

**Determination of the Antidegradation Based Average Concentrations**

Antidegradation based average concentrations (ADBACs) are determined for all parameters except ammonia, by using the mass-balance equation, and substituting the SCT in place of the water quality standard, as shown in the following equation:

$$ADBAC = \frac{SCT \times Q_3 - M_1 \times Q_1}{Q_2}$$

Where,

$Q_1$ = Upstream low flow (1E3 or 30E3 based on either the chronic or acute standard)
$Q_2$ = Current design capacity of the facility
$Q_3$ = Downstream flow ($Q_1 + Q_2$)
$M_1$ = Current ambient water quality concentration (From Section III)
$SCT$ = Significant concentration threshold

When $Q_1$ is equal to zero, $Q_2$ equals $Q_3$, and therefore the following equation results:

$$ADBAC = SCT$$

The ADBACs were calculated using the SCTs, and are set forth in Table A-9.

**Table A-9**

**SCTs and ADBACs**

| *Pollutant* | *$Q_1$(cfs)* | *$Q_2$ (cfs)* | *$Q_3$ (cfs)* | *$M_1$* | *SCT* | *ADBAC* |
|---|---|---|---|---|---|---|
| E. coli (#/100 ml) | 0 | 0.02 | 0.02 | 1 | 26 | 26 |
| TRC (mg/l) | 0 | 0.02 | 0.02 | 0 | 0.0054 | 0.0054 |

## Concentration Significance Tests

The concentration significance determination test considers the cumulative impact of the discharges over the baseline condition. In order to be insignificant, the new or increased discharge may not increase the actual instream concentration by more than 15% of the available increment over the baseline condition. The insignificant level is the ADBAC calculated in Tables A-10. If the new WQBEL concentration is greater than the ADBAC, an AD limit would be applied.

**Table A-10**

**Concentration Significance Test**

| *Pollutant* | *New WQBEL* | *ADBAC* | *Concentration Test Result* |
|---|---|---|---|
| E. coli (#/100 ml) | 126 | 26 | Significant |
| TRC (mg/l) | 0.011 | 0.0054 | Significant |

For all, the WQBELs are greater than the ADBACs and therefore, the concentration test results in a significance determination, and the antidegradation based effluent limitations (ADBELs) must be determined.

## Antidegradation Based Effluent Limitations (ADBELs)

The ADBEL is defined as the potential limitation resulting from the AD evaluation, and may be either the ADBAC, the NIL, or may be based on the concentration associated with the threshold load concentration (for the bioaccumulative toxic pollutants). ADBACs, NILs and TLs have already been determined in the AD evaluation, and therefore to complete the evaluation, a final comparison of limitations needs to be completed.

Note that ADBACs and NILs are not applicable when the new WQBEL concentration (and loading as evaluated in the New and Increased Impacts Test) is less than the NIL concentration (and loading), or when the new WQBEL is less than the ADBAC.

Where an ADBAC or NIL applies, the permittee has the final choice between the two limitations. A NIL is applied as a 30-day average (and the acute WQBEL would also apply where applicable) while the ADBAC would be applied as a 2 year rolling average concentration. For the purposes of this WQA, the Division has made an attempt to determine whether the NIL or ADBAC will apply. The end results of this AD evaluation are in Table A-11, including any parameter that was previously exempted from further AD evaluation, with the final potential limitation identified (NIL, WQBEL or ADBAC).

**Table A-11**

**Final Selection of WQBELs, NILs, and ADBACs**

| *Pollutant* | *NIL* | *New WQBEL* | *ADBAC* | *Chosen Limit* |
|---|---|---|---|---|
| E. coli (#/100 ml) | 64 | 126 | 26 | NIL |
| TRC (mg/l) | 0.0017 | 0.011 | 0.0054 | ADBAC |
| NH3 as N, Tot (mg/l) Jan | 8.4 | 5.24 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Feb | 8.4 | 5.27 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Mar | 7.7 | 5.08 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Apr | 7.1 | 5.08 | NA | WQBEL |
| NH3 as N, Tot (mg/l) May | 6.6 | 5.08 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Jun | 4.8 | 4.59 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Jul | 4.4 | 3.98 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Aug | 3.8 | 4.12 | NA | NIL |
| NH3 as N, Tot (mg/l) Sep | 4.8 | 4.08 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Oct | 5.6 | 4.59 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Nov | 6.6 | 5.08 | NA | WQBEL |
| NH3 as N, Tot (mg/l) Dec | 8.4 | 5.11 | NA | WQBEL |

For the following parameters, E. coli and ammonia (August), the NILs have been established for this facility. The NILs were selected as they are less stringent than the WQBELs and the ADBACs. However, the facility has the final choice between the NILs and ADBACs, and if the ADBAC is preferred, the permit writer should be contacted.

For the following parameters, TRC, the ADBACs have been established for this facility. The ADBACs were selected as they are less stringent than the WQBELs and the NILs, or perhaps due to the application as a two-year rolling average. However, the facility has the final choice between the NILs and ADBACs, and if the ADBAC is preferred, the permit writer should be contacted.

## Alternatives Analysis

If the permittee does not want to accept an effluent limitation that results in no increased impact (NIL) or in insignificant degradation (ADBAC), the applicant may conduct an alternatives analysis (AA). The AA examines alternatives that may result in no degradation or less degradation, and are economically, environmentally, and technologically reasonable. If the proposed activity is determined to be important economic or social development, a determination shall be made whether the degradation that would result from such regulated activity is necessary to accommodate that development. The result of an AA may be an alternate limitation between the ADBEL and the WQBEL, and therefore the ADBEL would not being applied. This option can be further explored with the Division. See Regulation 31.8 (3)(d), and the Antidegradation Guidance for more information regarding an alternatives analysis.

# VIII. Technology Based Limitations

**Federal Effluent Limitation Guidelines**

The Federal Effluent Limitation Guidelines for domestic wastewater treatment facilities are the secondary treatment standards. These standards have been adopted into, and are applied out of, Regulation 62, the Regulations for Effluent Limitations.

**Regulations for Effluent Limitations**

Regulation No. 62, the Regulations for Effluent Limitations, includes effluent limitations that apply to all discharges of wastewater to State waters, with the exception of storm water and agricultural return flows. These regulations are applicable to the discharge from the proposed discharge.

Table A-12 contains a summary of the applicable limitations for pollutants of concern at this facility.

**Table A-12**

**Regulation 62 Based Limitations**

| *Parameter* | *30-Day Average* | *7-Day Average* | *Instantaneous Maximum* |
|---|---|---|---|
| $BOD_5$ | 30 mg/l | 45 mg/l | NA |
| $BOD_5$ Percent Removal | 85% | NA | NA |
| TSS, mechanical plant | 30 mg/l | 45 mg/l | NA |
| Total Residual Chlorine | NA | NA | 0.5 mg/l |
| pH | NA | NA | 6.0-9.0 s.u. |
| Oil and Grease | NA | NA | 10 mg/l |

# IX. References

**Regulations:**

*The Basic Standards and Methodologies for Surface Water, Regulation 31*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective January 31, 2013.

*Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins, Regulation No. 35*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective 6/30/2013

*Colorado River Salinity Standards, Regulation 39, CDPHE, WQCC (last update effective 8/30/97)*

*Regulations for Effluent Limitations, Regulation 62*, CDPHE, WQCC, July 30, 2012.

*Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation 93*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 30, 2012.

**Policy and Guidance Documents:**

*Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance,* Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

*Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0,* Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

*Rationale for Classifications, Standards and Designations of Segments of the Gunnison River*, Colorado Department Public Health and Environment, Water Quality Control Division, effective 3/30/2013.

*Policy Concerning Escherichia coli versus Fecal Coliform*, CDPHE, WQCD, July 20, 2005.

*Colorado Mixing Zone Implementation Guidance*, Colorado Department Public Health and Environment, Water Quality Control Division, effective April 2002.

*Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits*, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.

*Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops,* Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-24, effective March 10, 2008.

*Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits,* Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.